HEALTH SERVICES RESTRUCTURING COMMISSION
COMMISSION DE RESTRUCTURATION DES SERVICES DE SANTÉ

Co-ordinating and Consolidating
Specialized Pediatric Services in Ontario

February 1999

103-01223/

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An underlying objective of all the work undertaken by the Health Services Restructuring Commission (HSRC) is the creation of a health services system able to ensure that people receive both the level of care appropriate to their needs as close to their homes as possible and the highest quality of care, supported by a critical mass of expertise and services.

It is clear that children in Ontario benefit from an extensive range of pediatric services, education and research provided by, among others, a number of highly regarded academic health science centres, including the Children's Hospital of Eastern Ontario (CHEO) in Ottawa, the Children's Hospital of Western Ontario, part of London Health Sciences Centre (LHSC), the Hamilton Health Sciences Corporation (HHSC), the Hospital for Sick Children (HSC) in Toronto and the Kingston Hospitals (Kingston General Hospital (KGH) and Hôtel Dieu Hospital). A number of other large urban centres (i.e., Sudbury, Thunder Bay and Windsor) also offer and deliver exceptional care to children.

As part of its review of hospital services in Ontario, the HSRC identified the fragmentation of child and adolescent services as a significant health care concern requiring improved coordination.[1] This fragmentation occurs in a number of areas both within and between hospitals and among community agencies. The lack of service coordination[1] was highlighted as a possible source of unnecessary duplication, resource waste and potential less-than-optimum child health outcomes. Therefore the HSRC recommended establishing of regional pediatric networks in London, Ottawa and Toronto as a co-ordinating mechanisms.

Throughout its work, the HSRC has directed a number of changes concerning the sizing and siting of neonatal and pediatric care services – particularly related to secondary services in large urban centres. The potential for consolidating highly specialized low volume services in Ontario was also identified as an issue of specific importance. This report summarizes the work and recommendations of the HSRC regarding this issue.

The structure of this report is as follows:

Section I	Introduction and overview of the mandate and vision of the HSRC.
Section II	Overview of the work and recommendations of the Provincial Pediatric Task Force (PPTF) and the Review Panel.
Section III	Review of the future needs for pediatric services in Ontario.
Section IV	Recommendations on co-ordination of specialized pediatric services in Ontario.
Section V	Recommendations for siting the specific specialized tertiary and quaternary pediatric services.
Section VI	Financial impact of potential service consolidation.
Section VII	Concluding comments.

On the basis of advice received in written submissions, and the informal admission policies of many adult inpatient providers, the HSRC has defined *pediatrics* as being limited to patients up to and including 14 years of age for all but mental health services. For child and adolescent mental health services, the HSRC

[1] Health Services Restructuring Commission. Thunder Bay Health Services Restructuring report (October 1996), London health Services Report (February, 1997), Metropolitan Toronto Health Services Restructuring (July, 1997), Ottawa Health Services Restructuring Report (August, 1997)

has developed bed targets for the population under age 18.[2] This age definition has been adopted by the HSRC for the purpose of this report. It is not intended to be criterion for admission to either pediatric or adult health care facilities.

[2] Health Services Restructuring Commission, Change and Transition: Planning Guidelines and Implementation Strategies for Home Care, Long Term Care, Mental Health, Rehabilitation and Sub-acute care.

SECTION 1: INTRODUCTION

In its review of hospital-based services in London, Toronto and Ottawa, the HSRC identified the need to examine further the provision of highly specialized, low volume pediatric series throughout the province.

A number of highly specialized pediatric programs have already been consolidated to one or a very few provincial centres, primarily due to their complexity and the very small number of patients affected (e.g. Bone Marrow Transplantation, Extra-corporeal Membrane Oxygenation (ECMO)).

Access to care close to home is an important consideration in siting all services. It is, however, particularly relevant when considering location of tertiary and quaternary pediatric services to which not only the patient but the child's family must also travel. In making the necessary "trade-off" relating to the siting of such highly specialized programs (such as pediatric cardiac surgery), the HSRC believes that providing access to the highest quality of care outweighs the need for local access. Research makes it clear that quality of outcomes (whether for children or adults) is directly related to the number of similar cases done; critical mass facilitates the recruitment and retention of specialized staff, the enhancement of skills in performing specialized procedures, and the development of effective peer review practices.

The main objective for changing the way specialized pediatric services are provided is to sustain and improve the quality of care provided by increasing the critical mass of these programs, primarily though the consolidation of existing "small volume" programs. Another key factor in maintaining quality of patient care and ensuring equitable access for children who require highly specialized services is through increased collaboration among pediatric inpatient providers.

Highly specialized pediatric services not only serve local needs but are province-wide resources. Given the limited critical mass of specialist physicians, nurses, therapists and other practitioners, technology and specialized centres necessary to ensure the highest possible quality of care, the number of hospitals at which they will be provided will be few.

Given the complexity of the issue, the HSRC's review process for highly specialized pediatric services has taken over 18 months to complete. As its starting point, the HSRC used the recommendations provided by two expert review panels – the Provincial Pediatric Task Force and the subsequent Review Panel.

The recommendations developed and outlined in this report provide a foundation for optimizing the quality and delivery of tertiary and quaternary services for children in Ontario.

The HSRC's Mandate and Terms of Reference

The HSRC is an independent body whose role is to make decisions about hospital restructuring and to advise the Minister of Health on restructuring other aspects on Ontario's health services system. The HSRC's four-year mandate consists of three specific and closely related components:

- To make decisions about restructuring Ontario's public hospitals;
- To provide advice to the Minister of Health about which health services will require reinvestment as a result of changes to the hospital system and changing needs of the population; and
- To make recommendations to the Minister on restructuring other components of the health care system to improve overall quality of care, outcomes and efficiency and help create a genuine, integrated health services system.

Overview of the Report

This report presents the results of the analysis undertaken by the HSRC concerning the restructuring of specialized pediatric services. The report builds on the advice and recommendations provided by the Provincial Pediatric Task Force (PPTF) and a Review Panel appointed subsequently. The HSRC's analysis of tertiary and quaternary pediatric services has also taken into account the deliberations and conclusions of previous HSRC reports as they related to pediatric health services.

The HSRC believes firmly that the recommendations in this report provide a solid foundation on which to continue to build a pediatric hospital system capable of effectively meeting the needs of children into the next century.

SECTION II: OVERVIEW OF THE WORK AND RECOMMENDATIONS OF THE PROVINCIAL PEDIATRIC TASK FORCE AND THE REVIEW PANEL

The Provincial Pediatric Task Force (PPTF)

In March 1997, the HSRC announced that it would establish a PPTF to address the issue of program consolidation and co-ordination of services related to low volume tertiary and quaternary pediatric services. The decision to establish the PPTF was precipitated by the HSRC's review of health services in major urban centres across the province.

Established in July 1997, the mandate of the PPTF was to recommend opportunities for consolidating tertiary and quaternary services into a single delivery system and/or to identify those programs with sufficient volumes to warrant multiple regional delivery sites. The work of the PPTF was guided by the following terms of reference:

- To review program activity of pediatric tertiary and quaternary services which have the potential for consolidation within the province.
- To recommend the programs and services that should be consolidated for service delivery, as well as the preferred sites for services delivery.
- To identify the implications for health professional education and research in pediatrics, and plan for accommodation of academic activities within the recommended consolidation plan.
- To develop a general implementation strategy for achieving the recommended consolidations.

The PPTF was requested to take into consideration the following issues:

- Critical mass for quality of care;
- Patient and family access to pre-admission care, in–hospital services and specialty ambulatory follow-up clinics; and,
- Clinical activity required to support teaching and research programs.

Membership of the PPTF included representation from the following institutions:

- Hospital for Sick Children (Toronto),
- Children's Hospital of Eastern Ontario (Ottawa),
- Kingston Hospitals (Hôtel Dieu and Kingston General Hospitals),
- London Health Sciences Centre (Children's Hospital of Western Ontario),
- Hamilton Health Sciences Corporation,
- Hôtel Dieu Grace Hospital (Windsor),
- Thunder Bay Regional Hospital,
- Sudbury Regional Hospital,
- The University of Toronto,
- University of Western Ontario,
- University of Ottawa,
- Queen's University, and
- McMaster University.

Highlights of the PPTF Recommendations

The PPTF presented its recommendations to the HSRC in December 1997. The main recommendations of the PPTF can be summarized as follows:

1. Given the absence of compelling information revealing problems arising from the *status quo*, the pre-existing configuration of tertiary and quaternary pediatric programs in Ontario should be maintained.

2. The organization and co-ordination of pediatric care in Ontario should be revised with expansion of some services and facilities in certain areas.

3. The funding available for pediatric programs should be increased.

4. A centrally administered provincial pediatric health care network should be established with three regional authorities each vested with secure, dedicated funding and a mandate to plan and evaluate child health services in the province.

HSRC Response to the PPTF Recommendations

Following its review of the recommendations for the PPTF, the HSRC concluded that further examination of the provincial provision of highly specialized tertiary and quaternary pediatric services was required.

The HSRC concluded that the mandate assigned to the PPTF had not been fully addressed. Specifically, the lack of conclusions about the need for appropriate critical mass and greater provincial coordination of highly specialized, low volume pediatric services could result in a lack of access to the best quality care for these services and potentially less than-optimum child health outcomes.

Accordingly, the HSRC assembled an independent review panel comprised of three physicians from outside Ontario (see Appendix A). The panel was asked to review the recommendations provided by the PPTF.

Review Panel

The Review Panel was asked to address the following questions:

1. Were the assumptions used by the PPTF in reaching their decisions reasonable?

2. Were the assessment and conclusions reached by the PPTF in their review of tertiary and quaternary pediatric programs reasonable and consistent?

The review panel invited the five academic health science centres (Children's Hospital of Eastern Ontario (CHEO), Hamilton Health Sciences Corporation (HHSC), Hospital for Sick Children (HSC), Kingston Hospitals (KGH and HDH) General Hospital (KGH) and London Health Sciences Centre (LHSC) to provide written submissions to the HSRC. Meetings were held with representatives from each of the centres on August 4th and 5th, 1998.

Highlights of the Review Panel Recommendations

The Review Panel acknowledged the sometimes inconclusive information from research concerning the relationship of critical mass to patient outcomes. However, the panel agreed that the evidence and the concern for Ontario children weighted in favour of accepting the principle that pediatric patient volumes, as in other situations, was important.

The Panel identified opportunities for consolidation of two services: pediatric cardiac surgery and transplantation. The Panel recommended that cardiac surgery for patients under age 15 be provided at two centres, HSC and CHEO and that all pediatric cardiac surgery services currently being provided by LHSC, be transferred to the HSC.

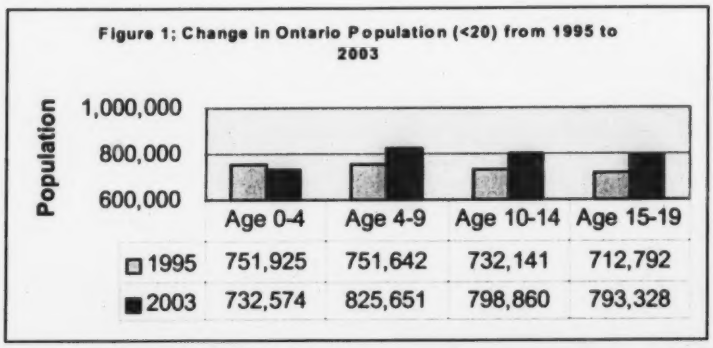
Pediatric organ transplants are performed at both HSC and LHSC. Based on the high level of complexity and the low number of cases, the Review Panel recommended that these services be consolidated at the HSC.

The Review Panel saw merit in establishing a co-ordinating group to foster collaboration among the tertiary providers. However, the Review Panel did not support the PPTF's recommendation to establish regional authorities to oversee pediatric services. The Review Panel suggested a provincial pediatric co-ordinating group be established with a mandate to:

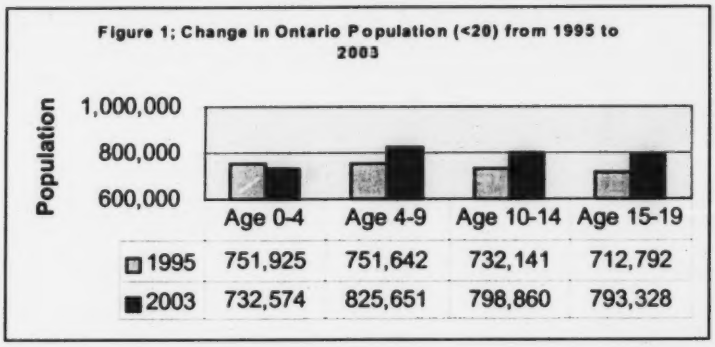
- Develop outcome evaluation projects and standards for reporting;
- Develop an information management system for clinical information, outcomes and costs of pediatric care in the province;
- Provide a collaborative network for the direction of corridors of referral; and,
- Set-up a review of the transportation system with a view to making recommendations on how to meet the needs of older pediatric as well as neonatal patients.

SECTION III: FUTURE PEDIATRIC SERVICE REQUIREMENTS

Future Growth in Pediatric Population



Between 1995 and 2003, the Ontario population under the age of 15 is expected to grow by 5 per cent (see Figure 1). This is considerably below the overall population increase of 10 per cent projected between 1995 and 2003 based on the most recent census[3]. It can be assumed that the need for pediatric services will grow in proportion to the population in this age group. Therefore, no significant increase in the need for specialized pediatric services is expected in the foreseeable future.



Tertiary Pediatric Providers

Tertiary pediatric inpatient services are provided in a number of specialized pediatric centres, academic health centres and large community hospitals in the province. The tertiary pediatric caseloads of the largest pediatric inpatient facilities by age group are listed in Table 1.

The five pediatric academic centres (LHSC, HSC, HHSC, CHEO, and KGH) tend to provide most specialized care for the youngest children. Children age 15 and older often receive specialized care from adult tertiary providers.

Table 1: Tertiary Pediatric Separations By Facility

FACILITY	Ages 0 - 4		Ages 5-9		Ages 10-14		Total	
Hospital for Sick Children	1,100	(48%)	861	(48%)	856	(45%)	2817	(48%)
Children's Hospital of Eastern Ontario	303	(13%)	190	(11%)	200	(11%)	693	(12%)
Hamilton Health Sciences Corp	251	(11%)	123	(7%)	151	(8%)	525	(9%)

[3] Statistics Canada, 1996 Census.

London Health Sciences Centre	191	(8%)	142	(8%)	169	(9%)	502	(8%)
Kingston Centres*	50	(2%)	40	(2%)	41	(2%)	131	(2%)
Windsor Hotel Dieu Grace	40	(2%)	28	(2%)	33	(2%)	101	(2%)
Sudbury General	15	(1%)	12	(1%)	17	(1%)	44	(1%)
Thunder Bay Regional	15	(1%)	6	(<1%)	13	(1%)	34	(1%)
Other Provincial Providers	303	(13%)	384	(21%)	392	(21%)	1079	
Total	2290	(100%)	1795	(100%)	1885	(100%)	5926	(100%)

Source: CIHI 1995/96

* INCLUDES KINGSTON GENERAL AND KINGSTON HOTEL DIEU

SECTION IV: RECOMMENDATIONS FOR CO-ORDINATION OF SPECIALIZED PEDIATRIC SERVICES IN ONTARIO

In its review of a number of communities, the HSRC has recognized the need for additional co-ordination of pediatric services. The PPTF also recognized the need for a formal co-ordinating mechanism. To achieve this, the PPTF recommended the establishment of a Child Health Evaluation Panel to provide expertise on the collection of objective data on quality and costs of pediatric health care in Ontario.

The Review Panel also agreed that collaborative networks were needed, focusing on information management, quality monitoring, costing, resource allocation and outcome evaluation of pediatric services. To achieve these goals, the Review Panel recommended that the five provincial academic health science centres, with leadership from the HSC, form a Pediatric Co-ordinating Group accountable tot he Ministry of Health with the mandate to address the need for co-ordination and integration of pediatric care.

The PPTF also considered the merit of a co-ordinating body specific to pediatric oncology. The PPTF endorsed a proposal by the Pediatric Oncology Group of Ontario (POGO) to establish a provincial pediatric program for childhood cancer control distinct from Cancer Care Ontario (CCO). The Review Panel, while supportive of the role of POGO, concluded that a program separate from CCO was not in the best interest of quality, integrated, long-term care for children with cancer.

HSRC's Deliberation

One of the strongest areas of consensus in the PPTF was the need for ongoing dialogue and joint research among the academic health sciences centres. The HSRC endorses the need for ongoing dialogue through a more formal organizational structure with the requisite resources to maintain it if derived from the membership. The PPTF confirmed the need to co-ordinate pediatric services in the province and noted that the success of many research efforts, particularly in the areas of outcome evaluation and costs that require multi-centered data collection, is dependent on collaborative efforts.

Both the PPTF and the Review Panel noted the leadership and pre-eminence of the HSC as both an asset and a liability. While the prominent role played by the HSC must be acknowledged, that role should be carried out sensitively and in ways that do not diminish or overshadow the important roles of the other pediatric centres in Ontario. There are number of challenges facing pediatric care centres, such as transportation services for older pediatric patients, that are common to all the providers in the province and can only be addressed effectively by a coordinated effort.

Finally, the HSRC does not have sufficient information to make a recommendation regarding the organization of pediatric cancer services in the province. It does concur, however, in the Review Panel's concern that pediatric cancer services should not be provided independent of the organization responsible for the co-ordination of all other cancer services, i.e., Cancer Care Ontario.

HSRC's Conclusions

The HSRC recommends that a Pediatric Co-ordinating Group be established to include as its main partners the five academic pediatric health sciences centres. The mandate of this Group should be as follows:

- To develop guidelines to ensure quality outcomes, minimum volumes for critical mass and possible consolidation of additional pediatric tertiary and quaternary services not addressed by the HSRC;
- To provide expertise in evaluating new procedures and technologies in pediatric health care;
- To co-ordinate the development of outcome evaluation projects and standards of reporting;
- To co-ordinate the development of information management systems for clinical information, outcomes and costs of pediatric care in the province;
- To provide a collaborative network for directing patient referrals to tertiary centres;
- To provide a recommendation for organization and co-ordination of pediatric cancer services and planning in Ontario; and
- To conduct a review of the transportation system with a view to making recommendations on how to meet the needs of older pediatric patients as well as neonatal patients.

Membership of the Co-ordinating Group should be comprised of equal representation from the major secondary, tertiary and quaternary pediatric hospital service providers. Membership of the group comes from a least the following organizations:

- Hôtel Dieu Grace Hospital in Windsor
- London Health Sciences Centre
- Hamilton Health Sciences Corporation
- Hospital for Sick Children in Toronto
- Kingston Hospitals (KGH &HDH)
- Children's Hospital of Eastern Ontario
- Thunder Bay Regional Hospital
- Sudbury Regional Hospital
- Institute of Clinical Evaluative Sciences (ICES).

Representation from other groups may be added either to the Co-ordinating Group itself or to such sub-committees as may be considered by the Co-ordinating Group.
The HSRC recommends that ICES, in collaboration with HSC, assume a leadership role for the *initial two years*. After this time, the HSRC recommends that ICES continue to provide co-ordination and administrative support for the co-ordinating Group, but the position of chairperson be rotated among the pediatric health science centres.

The HSRC encourages the Co-ordinating Group to establish partnerships with other appropriate providers such as POGO and other pediatric services organizations.

This committee will be accountable to the Ministry of Health and the HSRC. The HSRC is advising the Ministry of Health to provide administrative funding for the Co-ordinating Group.

SECTION V: RECOMMENDATIONS FOR SITING TERTIARY AND QUATERNARY PEDIATARIC SERVICES

Cardiac Surgery

Tertiary pediatric cardiac surgery procedures include cardiac valve replacement, coronary artery bypass, angioplasty (PTCA) and other major chest procedures. These procedures may or may not involve the use of a heart-lung machine or pump-oxygenator.

The Review Panel considered the current surgical volumes at the three centres, research evidence regarding minimum volumes in relation to patient outcomes and the potential impact of program consolidation on medical education. It recommended the consolidation of pediatric cardiac surgery in two centres: HSC and CHEO

The PPTF recommended that pediatric cardiac surgery continue to be provided at three centres: LHSC, CHEO and HSC. In part its conclusion was based on the need for local access to these services. It further concluded that based on the criterion of quality there was not sufficient evidence to adopt a minimum number of cases below which these procedures should not be done. Moreover, the PPTF concluded that mortality data provided by the three centres were indicative of acceptable performance levels in each centre. Another important bearing on the PPTF recommendation was the importance of the cardiac surgery programs to the three pediatric critical care medical residency programs concerned. There was also little information regarding the relative costs of the programs to determine their relative cost-efficiency.

HSRC Deliberations

Pediatric cardiac surgery volumes

Tables 2 and 3 summarize the pediatric cardiac surgery volumes in Ontario in the fiscal year 1995/96.

Table 2: Tertiary Cardiac Procedure Separations 1995/96

Cumulative Totals	London (LHSC)	Ottawa (CHEO)	Toronto (HSC)	Other	TOTAL
0 to 4 yrs.	21	45	233	3	302
0 to 9 yrs.	43	77	427	8	555
0 to 14 yrs.	61	98	547	21	727

Source: CIHI 1995/96

Table 3: Tertiary Cardiac Procedure (with Pump*) Separations 1996/96

Cumulative Totals	London (LHSC)	Ottawa (CHEO)	Toronto (HSC)	Other	TOTAL
0 to 4 yrs.	10	25	161	0	196
0 to 9 yrs.	18	48	305	0	371
0 to 14 yrs.	24	59	368	1	452

Source: CIHI 1995/96

* Procedures which involve the use of a heart-lung machine or pump oxygenater

Cardiac surgery volumes for pump cases were considered a rough indicator of the complexity of the surgical cases. The HSC has the largest pediatric cardiac surgery program in the province especially for cases affecting the youngest age groups (see Tables 2 and 3). In 1995/96, the HSC provided care for 81 per cent of the province's children under the age of five whose cases required pumps; CHEO provided care for 13 per cent and, 5 per cent were performed at LHSC. Table 4 summarizes the relative share of the total cases met by the pediatric cardiac surgery providers.

Table 4: Pediatric (<15 years) Cardiac Surgery Volumes, 1995/96

Centre	Cardiac Surgeries with Pump	All Cardiac Surgeries
LHSC	24 (5.3%)*	61 (8.4%)
CHEO	59 (13.1%)	98 (13.5%)
HSC	368 (81.4%)	547 (75.2%)
OTHER	1 (0.2%)	21 (2.9%)
TOTAL	452 (100%)	727 (100%)

* Column percentage

Source: CIHI 1995/96

Cardiac procedures (with and without pumps) for cases between the ages of 15 and 19 years of age were provided at all three of the academic pediatric cardiac programs as well as at all adult cardiac surgery centres.

Minimum Volumes for Pediatric Cardiac Surgery

The HSRC reviewed several reports that examine the relationship between pediatric patient outcomes and surgical volumes. Jenkins et al[4] found a significantly higher mortality rate post cardiac surgery in centres that performed less than 300 surgeries annually. Similarly, Hannan et al.[5] demonstrated that mortality rates associated with pediatric cardiac surgery were not only correlated with the hospital volumes but the volumes done by individual surgeons as well. This study concluded that patients served by hospitals with fewer than 100 surgeries annually, and surgeons with volumes of fewer than 75, had significantly higher mortality rates. Yet the PPTF cited a lack of convincing evidence of differential qualitative outcomes as a limitation in determining minimum volumes required to ensure high quality patient outcomes for pediatric cardiac surgery.

A number of other published studies have demonstrated an inverse relationship between pediatric cardiac surgery volumes and mortality [6 7 8] when volume related to both individual surgeons and the surgical centre are considered. Although none of these studies determined a minimum volume cut-off to ensure

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4 Jenkins KJ,Newburger JW, Lock JE et al, (1995). In-Hospital mortality for surgical repair of congenital heart defects: Preliminary observations of variation by hospital caseload. *Pediatrics, 85 (3)*, 323-330

5 Hannan EL, Racz M, Kavey RE, et al. (1998). Pediatric cardiac surgery; the effect of hospital and surgeon volume on in-hospital mortality. *Pediatrics, 101 (6)*.

6 Hannan EL, O'Donnell JF, Kilburn H et al. (1989). Investigation of the relationship between volume and mortality for surgical procedures performed in New York State hospitals. *JAMA, 262*, 510-510

7 Hannan EL, Kilburn, Bernard H et al. (1995). Coronary artery bypass surgery. The relationship between in-hospital mortality rate and surgical volume after controlling for clinical risk factors. *Medical Care*, 29, 1094-1107.

8 Stark, J. (1995). Quo Vadis pediatric cardiac surgery? *Ann R Coll Surg Engl*, 77, 217-221

high quality outcomes, all reported significantly better outcomes in high volume centres despite the observation that a higher proportion of complex cases were done in high volume hospitals.

Recently, the Cardiac Care Network of Ontario (CCN) released a report providing guidelines for the provision of adult cardiac surgical cases in Ontario. [9] The CCN expert panel recommended that a minimum of 500 cardiac surgical cases (requiring the use of pump or pump stand-by) should be completed at each cardiac surgical centre to ensure high quality of outcomes. Although the CCN guidelines are specific to adult surgical cases, the complexity of pediatric cases and the published research suggest strongly that a minimum number of procedures is necessary to maintain the skills of the individual surgeons and other health care professionals in cardiac centres, whether pediatric or adult. Conversely, they also suggest that the potential for optimal benefit to the patient is enhanced by consolidating programs to achieve a critical to optimal mass of expertise and of cases.

Some experts have suggested that given the range of cardiac surgical procedures required by pediatric patients, a pediatric cardiac surgeon requires an even broader range of skills than is necessary for exclusively adult cardiac surgeons. Unlike the cardiac surgery commonly required by adults, more than 40 operative procedures are performed to correct congenital heart defects in children[10], suggesting that the number of pediatric cardiac surgery done in a given centre or by a given surgeon should be a major consideration in ensuring quality of care. In addition, the literature supports that ample numbers of patients with the same condition are essential to studying clinical effectiveness and determining best practices, as well as keeping practitioner and care team skills honed.[11]

The pediatric cardiac surgery outcomes of the individual centres in Ontario are difficult to interpret. Given the low volumes in the Ottawa and London programs, data would need to be collected over many years in order to gather sufficient information to permit conclusions to be drawn on patient outcomes in those centres.

Impact on Medical Education

All reviewers recognized the importance of cardiac surgery programs in maintaining pediatric residency training in general, and the accredited pediatric critical care training program specifically. The HSC, LHSC and CHEO all offer residency training in pediatric critical care. Therefore, consolidation of pediatric cardiac surgery programs would impact medical education at any of the three existing centres.

The Specific Standards of Accreditation for Residency Programs in Pediatric Critical Care Medicine (Royal College of Physicians and Surgeons of Ontario) state:

> *In those cases where a university has sufficient resources to provide most of the training in pediatric critical care medicine but lacks one or more essential elements, the program may still be accredited provided that formal arrangements have been made to send residents to another accredited residency program for periods of appropriate prescribe training.*

Therefore, the provisions in the Royal College guidelines for critical care training programs can accommodate the consolidation of pediatric cardiac surgery programs.

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[9] Cardiac Care Network of Ontario, Consensus Panel on Cardiac Surgery Services in Ontario: Final Report and Recommendations, April 1998.

[10] Stark J. (1995). How to choose a cardiac surgeon. Presented at AHA meeting, Anaheim , California.

[11] Stenhardt, BJ (1995). Geographic and demographic limitations to competition in pediatric services: the case for regionalization, NACHRI, 1995.

Access to Services

Access to services close to home is a significant consideration for siting of all services, but particularly for pediatric services. The HSRC, PPTF and the Review Panel all recognized the importance of access for the pediatric population and their families.

In deliberating the siting of such highly specialized programs as pediatric cardiac surgery, the HSRC has taken the position that access to high quality care claims priority over local access. Decreasing the sites from three to two in Ontario has a minimal effect on accessibility. Greater benefit to children with heart defects is provided by the safeguard to quality care that is provided by consolidating services. The continued access to pediatric cardiac surgery for francophone patients and their families was an important consideration given by the HSRC with respect to its decision to maintain this program in CHEO.

Impact of Program Consolidation on the Centres' Overall Cardiac Surgery Program

The cardiac surgery programs at the HSC and CHEO are focussed only on pediatric patients; therefore, program consolidation that removes this service from either of these two centres would result in closure of their entire cardiac surgery program. Pediatric cardiac surgery, however, is only a small portion of the overall cardiac surgery program at LHSC. Table 5 illustrates the size of the pediatric cardiac surgery caseload at LHSC relative to the overall program. The cardiac surgery pump cases performed on patients under the age of 15 constitutes less than 2 per cent of the total cardiac surgery program at LHSC.

Table 5: LHSC Cardiac Surgery (with Pump) Caseload 1995/96

AGE GROUP	CASES	PATIENT DAYS
0 to 14 Years	24	202
All Cases	1,369	17,489
% of Total Cardiac Surgery Cases	1.8%	1.2%

Source: CIHI 1995/96

HSRC Conclusions

The HSRC weighted the importance of access to pediatric cardiac surgery in Southwestern Ontario against the assurance of the highest possible quality of outcomes. As noted in the discussion above, published reports in pediatric and adult cardiac surgery clearly demonstrate an inverse relationship between procedure volumes and patient morality rates. Of the three pediatric cardiac surgery providers in the province, only the HSC clearly meets annual minimum volume requirements. If a cut-off of 100 cases annually per centre[4] for patients under 15 years is accepted as a bare minimum, CHEO is very close to that minimum, whereas the London program which had approximately 60 tertiary cardiac procedures in 1995/96, falls well below it.

The HSRC advises that the three current cardiac surgery sites in Ontario should be consolidated in two centres: the HSC in Toronto and the CHEO in Ottawa.

The HSRC recommends that LHSC, in conjunction with the HSC and/or CHEO, arrange for clinical rotations at one or both of these accredited programs for their pediatric critical care medical residents.

Given that the CHEO program provides services for more than Ontario residents and has extensive French language services, [12] strategies should be undertaken to increase the current caseload. Given the relatively low volumes at CHEO, the HSRC encourages the hospital to maintain and establish additional arrangements, in collaboration with HSC, to attract sufficient cases to increase patient volumes. The

[4] Hannan EL, O'Donnell JF, Kilburn H et al. (1989). Investigation of the relationship between volume and mortality for surgical procedures performed in New York State hospitals. *JAMA, 262*, 510-510

[12] CHEO currently provides care for significant number of out-of-province patients from Quebec and Newfoundland.

HSRC is recommending that CHEO, HSC and the Ministry of Health (MoH) formulate a plan for the potential redistribution of pediatric cardiac surgical cases with the goal of increasing the Ottawa caseload to an annul minimum of 200 pediatric cardiac surgery cases.

The HSRC further recommends that if in 18 months, the program at CHEO has not demonstrated it will meet in short order a minimum volume of 200 cases per year the MoH should take steps to consolidate all provincial cardiac surgery cases at HSC. If full consolidation of the pediatric cardiac surgery program is undertaken, the Ministry of Health must ensure that patients and families have access to French language services at the HSC through designation under the French Language Services Act for its cardiac program.

Organ Transplantation

Published investigations have found a positive relationship between the number of transplants performed by centres and patient outcomes. As with cardiac surgery, the risk of mortality is substantially higher in low-volume centres than those performing a relatively high number for both heart transplants [13] and kidney transplants [14].

Organ transplantation for children is currently performed at two sites in the province, HSC and LHSC. The Review Panel recommended that all kidney, liver and heart transplants be consolidated at HSC. In contrast, the PPTF recommended that transplantation services be available at the following sites:

Organ Transplants	Sites
Kidney	London, Ottawa, Toronto
Liver	London, Toronto
Heart	London, Toronto
Lung	Toronto

HSRC Deliberations

The HSRC examined the number of pediatric transplant cases in 1995/96 contained in the CIHI database. The program volumes are summarized in Tables 6, 7 and 8.

Table 6: Pediatric Heart Transplant Volumes 1995/96

Cumulative Total	London (LHSC)	Ottawa (CHEO)	Toronto (HSC)	Other	Total
0 to 4 Years	0	0	2	0	2
O to 9 Years	0	0	4	0	4
0 to 14 Years	3	0	8	1	12

Source: CIHI, 1995/96

Table 7: Pediatric Kidney Transplant Volumes 1995/96

Cumulative Total	London (LHSC)	Ottawa (CHEO)	Toronto (HSC)	Other	Total
0 to 4 Years	0	0	2	0	2
O to 9 Years	0	0	9	0	9
0 to 14 Years	0	0	15	1	16

Source: CIHI, 1995/96

Table 8: Pediatric Liver Transplant Volumes 1995/96

Cumulative Total	London (LHSC)	Ottawa (CHEO)	Toronto (HSC)	Other	Total

[13] Hosenpud JD, Breen TJ, Edwards EB et al. (1994). The effect of transplant centre volume on cardiac transplant outcome. A report of the United Network for Organ Sharing Scientific Registry. *JAMA, 271*, 1844-1849

[14] Ogura K & Cecka JM. (1991). Centre effects in renal transplantation *Clin. Transpl.*, 245-246

0 to 4 Years	1	0	4	0	5
O to 9 Years	2	0	10	0	12
0 to 14 Years	4	0	11	0	15

Source: CIHI, 1995/96

The number of pediatric transplantation procedures is very low, especially for heart transplants. In 1995/96 there were no lung transplants performed on patients under age 15 at an Ontario hospital. With respect to liver transplants, five were performed in London and 11 at HSC in 1995/96 for children less than 15 years. CHEO did not perform any transplants for patients under 20 years of age.

Heart transplants are performed in London and Toronto. In 1995/96 the HSC provided eight heart transplants for patients under age 15 and LHSC provided three. London did not perform any kidney transplants for patients under age 15 and only two between the ages of 15 and 19 years in 1995/96. The only centre which has a pediatric kidney transplant program is HSC with 15 transplants in 1995/96 for patients under age 15.

The medical staffs of the hospitals in London have been pioneers in organ transplantation, mainly with adults. The excellence of the adult program will not suffer as a consequence of the recommended consolidation in HSC of pediatric organ transplantation. Of the 158 organ transplants performed at LHSC (1995/96) only seven (4 per cent) of the total procedures performed were for patients under 15 years old. Pediatric heart transplants constitute 10 per cent of the total heart transplant caseload and the four pediatric liver transplants represents 6 per cent of the total liver transplant caseload (see Tables 9 and 10).

Table 9: LHSC Heart Transplant Caseload, 1995/96

AGE GROUP	CASES	PATIENT DAYS
0 TO 14 Years	3	67
All Cases	30	1,170
% of Total Cases	10.0%	5.7%

Source: CIHI, 1995/96

Table 10: LHSC Liver Transplant Caseload, 1995/96

AGE GROUP	CASES	PATIENT DAYS
0 TO 14 Years	4	155
All Cases	64	1,910
% of Total Cases	6.3%	8.1%

Source: CIHI, 1995/96

HSRC's Conclusions

Consolidating pediatric transplantation services can facilitate the development and maintenance of expertise in surgical techniques, physician specialization, immuno-suppressive care and multi-disciplinary support. Given the low volumes of pediatric organ transplants, the HSRC recommends consolidation of kidney, heart, lung and liver transplants at the HSC for patients under 15 years of age.

Other Tertiary and Quaternary Pediatric Services

A number of highly specialized pediatric services such as bone marrow transplants, maxillo-facial surgery and extra-corporeal membrane oxygenation (ECMO) are only available at the HSC. The PPTF and the Review Panel have both recommended that given the highly specialized nature of these procedures this is appropriate. The HSRC supports the recommendation to provide these services exclusively at one site.

Highly, specialized pediatric procedures such as, larynogo-tracheal surgery, bladder extrophy surgery, specialized orthopedic surgery (e.g. spinal and repeat surgery), epilepsy surgery and cleft lip and palate repair have not been fully reviewed by the HSRC. Neither external review group made specific recommendations regarding these services. However, it was acknowledged that the provision of these procedures requires the availability of highly specialized health care professionals.

The PPTF recommended that primary cleft lip and palate repairs be provided only at centres with appropriate multi-disciplinary programs, including, dentistry, speech therapy and audiology. Although the PPTF did not find any guidelines regarding minimum volumes, it was suggested that this issue deserved additional attention. Currently, cleft lip and palate repairs are performed at all five pediatric academic health centres, in Windsor as well as other centres in the province.

HSRC's Deliberations and Conclusions

The HSRC is not making specific recommendations regarding these services. However, the HSRC shares the PPTF's concerns regarding the issue of ensuring critical mass for primary cleft lip and palate procedures.

The HSRC recommends that the Pediatric Co-ordinating Group convene an expert panel(s) to develop guidelines for these procedures, with particular emphasis on primary cleft lip and palate procedures, which should include minimum volumes required to achieve critical mass. The HSRC recommends this be considered a priority task for the Co-ordinating Group.

SECTION VI: FINANCIAL IMPACT OF RESTRUCTURING

The financial impact of consolidating specialized pediatric services is associated with the transfer of weighted cases from LHSC to HSC.

The data used in the analysis are from Ontario Cost Distribution Methodology, 1995/96. The estimates do not take into account costs related to future inflation or other factors. There have also been changes in hospital budgets due to funding reductions that are not reflected in the 1995/96 data. In the development and assessment of detailed planning and implementation activities, the two hospitals and the Ministry of Heath will be expected to refine the estimates using more complete and current information.

To estimate the financial impact of transferring services, the HSRC used the Actual Cost per Weighted Case to estimate the budget reduction of LHSC and the LHSC Expected Cost per Weighted Case transfer the programs to the HSC. This leads to an estimate of the savings achieved through the consolidation of the two programs to one hospital. Other associated costs such as support services and administration costs are transferred in addition to the direct patient costs. In total the consolidation of the pediatric cardiac surgery and transplantation programs from LHSC to HSC would result in a transfer of funding less than $1 million (see Table 11)

The financial estimates for the consolidation of the cardiac surgery and transplantation programs for patients under the age of 15 are summarized in Table 11.

Table 11: Summary of Financial Impact of Program Consolidation

PROGRAM	WEIGHTED CASES*	Transferred from LHSC	Transferred from HSC
Cardiac Surgery	244	($676,421)	$651,304
Transplantation	91	($252,272)	$242,905
Total	335	($928,693)	$894,209

- CIHI 1995/96

SECTION VII: CONCLUSIONS

Collaboration, networks and integration are key to the provision of high quality tertiary and quaternary pediatric services as they are for many other specialized services. The need to balance quality of care, access to services and resources, including financial and specialized manpower resources, has made the restructuring of specialized pediatric services a difficult task. The HSRC recognizes the challenges and the magnitude of the task that it set out for the PPTF and the Review Panel, and applauds the dedication and contributions of all those who participated in the work of both of these groups.

The two reviews commissioned by the HSRC of tertiary and quaternary pediatric services provide the basis for the HSRC's recommendations. The HSRC expects that the plan for this important provincial resource will build on the commitment and excellence that now exists in Ontario.

On a final note, the HSRC notes that the HSC plays a prominent national and international role in pediatric service delivery, education and research. By virtue of that role the HSC must also discharge a leadership role in nurturing and mentoring the development of excellence among all academic and regional pediatric providers. A number of representations made to the HSRC noted strong concerns that the reputation and "style" of the HSC was perceived to overshadow the contributions of other pediatric providers in the province. The HSRC recommends the professionals and administrators at the HSC give close attention to the way in which they discharge their roles as leaders among their collaborators in the provision of pediatric care in Ontario and Canada. As well, the HSRC recommends that the HSC's ability to fulfil its leadership role be continually reviewed by the Pediatric Co-ordinating Group, if established, and the Ministry of Health.

For HSC to fulfill its leadership responsibilities effectively, to facilitate collaboration among all pediatric service providers in the province, it must do so as a partner of those other providers. This is essential to foster the highly valuable roles each provider plays in the provision of care, in research, and in the education of future health professionals.

SECTION VIII: SUMMARY

The HSRC, during its previous reviews of health services, identified fragmentation of child and adolescent services as a significant health care concern requiring improved co-ordination. The HSRC's recommendations for co-ordination and consolidation of highly specialized pediatric services build on the recommendations provided by two expert panels, the PPTF and the subsequent Review Panel.

To provide co-ordination of highly specialized pediatric services in the province, the HSRC is recommending a Pediatric Co-ordinating Group be established which will include representation from the major providers of pediatric tertiary services in the province. The Hospital for Sick Children will assume a leadership role for the initial two years.

The HSRC's objective in changing the way specialized pediatric services are provided is to sustain and improve the quality of care provided by increasing the critical mass of these programs, primarily through the consolidation of existing programs. The HSRC recommends the consolidation of cardiac surgery and transplantation services for children under the age of 15.

The HSRC has recommended that the pediatric cardiac surgery services be limited to the Children's Hospital of Eastern Ontario and the Hospital for Sick Children. The program and funding for this service at London Health Sciences Centre should be transferred to the HSC. The consolidation of pediatric cardiac surgery and transplantation programs from LHSC to HSC will result in a reduction of $929,000 for LHSC. In order to maintain the Pediatric Critical Care Residency Program in London, the HSRC is recommending that clinical rotations for medical residents be arranged at HSC or CHEO. The HSRC is further recommending that CHEO work with HSC and the Ministry of Health to increase the cardiac surgery caseload at this hospital to 200 cases per year. If this caseload cannot be achieved, the HSRC is advising the Ministry of Health to consolidate all services at HSC. In the event of the closure of the program at CHEO, HSC is to seek designation for its cardiac surgery program under the French Language Services Act.

The HSRC has also concluded that all pediatric heart, kidney and liver transplants should be consolidated at HSC.

APPENDIX A

Provincial Pediatric Task Force Membership

Chair: Dr. Richard Hamilton
Professor of Pediatrics
McGill University

Community	Representative	Alternate
Hamilton	Dr. Peter Fitzgerald (H) Pediatric Surgery Unit Director Deputy Chief of Surgery Children's Hospital Hamilton Health Sciences Corporation	Mr. Scott Rowand (H) President & Chief Executive Officer Hamilton Health Sciences Corporation
	Dr. Jack Holland (U) Chair of the Department of Pediatrics Faculty of Health Sciences McMaster University	Dr. Joffe (U) Dean Faculty of Health Sciences McMaster University
Kingston	Dr. Kimberley Dow (H) A/Head, Dept of Pediatrics Queen's University Joint Chief of Pediatric Kingston General and Hotel Dieu	Ms. Carolanne Vair (H) Assistant Executive Director Patient Care Hotel Dieu Hospital
Kingston	Dr. Barry Smith (U) Dean and Vice Principal Faculty of Health Sciences Queen's University	Dr. Brian Wherrett (U) Department of Pediatrics Hotel Dieu Hospital
London	Dr. David Girvan (H) Chief, Division of Pediatric Surgery London Health Sciences Centre Victoria Campus	Mrs. Ellen Rosen (H) Manager, Children's Care London Health Sciences Centre Victoria Campus
	Dr. Tim Frewen (U) Chair of Pediatrics Children's Hospital of Western Ontario	Dr. Victor Han (U) St. Joseph's Health Centre Department of Pediatrics
Toronto	Dr. Hugh O'Brodovich (U) Professor and Chair Department of Pediatrics Faculty of Medicine, U of T Hospital for Sick Children	Dr. Ron Laxer (U) Professor and Deputy Chair Department of Pediatrics Faculty of Medicine, U of T Hospital for Sick Children
Toronto	Dr. Alan Goldbloom (H) Vice President Academic & Clinical Development Hospital for Sick Children	Ms. Mary Federau (H) Vice President Child Health Service Hospital for Sick Children
Ottawa	Dr. Bob Peterson (H) Chief of Paediatrics Children's Hospital of Eastern Ontario	Mr. Gary Cardiff (H) President Children's Hospital of Eastern Ontario
Ottawa	Dr. Pierre Soucy (U) Chief, Pediatric General Surgery Children's Hospital of Eastern Ontario	Dr. Arles Dungy (U) Associate Dean, Professional Affairs University of Ottawa
Sudbury	Dr. M. B. Abdurrahman (H)	Dr. Michael Storr (H) Medical Director, Children's Program Laurentian Hospital
Thunder Bay	Dr. George Derbyshire (H)	Mrs. Anne Ross (H)

	Chief of Pediatrics Thunder Bay Regional Hospital	Director of Maternal/Child Services A/Vice President of Clinical Services Thunder Bay Regional Hospital
Windsor	Mrs. Joanne Gagnon (H) Assistant Executive Director Patient Care Hotel-Dieu Grace Hospital	Dr. Lena Morgan (H) Pediatric Academy Chair Hotel-Dieu Grace Hospital

Review Panel Membership

Representative	Affiliation
Charles Wright, MB, MSc, FRCS (C,E,Ed) (Chair)	Director, Centre for Clinical Epidemiology and Evaluation Vancouver Hospital & Health Science Centre
Brian Postl, MD, FRCPC (Community Medicine, Pediatrics)	Vice-President, Clinical Services Winnipeg Hospital Authority
Michel A. Bureau, MD, FRCPC (Pediatrics), FACCP	President, Fonds de la recherche en Santé du Quebec Former Dean, University of Sherbrooke Medical School